

# **Summary of Morrison Creek Lamprey (*Lampetra richardsoni* variety *marifuga*) Trapping Studies 2011-2014**

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SUMMARY OF MORRISON CREEK LAMPREY (*Lampetra richardsoni* variety *marifuga*)  
TRAPPING STUDIES 2011-2014

by

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## ABSTRACT

Wade, J., MacConnachie, S. 2014. Summary of Morrison Creek Lamprey (*Lampetra richardsoni* variety *marifuga*) trapping studies 2011-2014. Can. Manuscr. Rep. Fish. Aquat. Sci. 3047: iv + 14p.

Morrison Creek lamprey, *Lampetra richardsoni* variety *marifuga* are found only in Morrison Creek in Courtenay, BC. In 1995, this variety was designated Endangered by COSEWIC and is currently protected under the *Species at Risk Act* (SARA). As an endangered species listed under SARA, it is a requirement that an action plan be created based on the species' recovery strategy. In order to inform the action plan, information regarding the population abundance and distribution of the species is required. For three years, 2011-2013, efforts were made to live trap Morrison Creek lamprey on and around spawning time, as little work had been done on this species since the 1980s.

Subsequent to critical habitat consultations for Morrison Creek lamprey in 2013, discussions began with Hancock Forest Management (HFM) regarding potential lamprey management on their property. In 2014, DFO worked collaboratively with HFM to assess the extent of the distribution of lamprey within the headwaters of Morrison creek on the land owned by the company. This report is a summary of field activities and a preliminary analysis of data for 2011 to 2014 inclusive.

## RÉSUMÉ

Wade, J. et MacConnachie, S. 2014. Résumé des études par piégeage de la lamproie du ruisseau Morrison (*Lampetra richardsoni*, variété *marifuga*) de 2011 à 2014. Rapp. manus. can. sci. halieut. aquat. 3047: iv + 14 p.

La lamproie du ruisseau Morrison (*Lampetra richardsoni*, variété *marifuga*) se trouve uniquement dans le ruisseau Morrison à Courtenay, en C.-B. En 1995, cette variété a été désignée comme étant en voie de disparition par le COSEPAC et elle est actuellement protégée par la *Loi sur les espèces en péril* (LEP). Comme c'est une espèce en voie de disparition figurant à la liste de la LEP, il est obligatoire de créer un plan d'action en fonction du programme de rétablissement de l'espèce. Pour servir de base à ce plan d'action, il fallait recueillir des renseignements au sujet de l'abondance de la population de l'espèce. Pendant trois ans, de 2011 à 2013, des efforts ont été déployés afin de piéger des lamproies du ruisseau Morrison vivantes aux alentours de leur période de frai. Peu de travaux avaient été effectués au sujet de cette espèce depuis les années 1980.

Après les consultations sur l'habitat essentiel de la lamproie du ruisseau Morrison effectuées en 2013, des discussions ont été amorcées avec Hancock Forest Management (HFM) au sujet de la possibilité de gérer les lamproies sur ses terres. En 2014, le MPO a collaboré avec HFM pour évaluer l'étendue de la répartition de la lamproie dans le cours supérieur du ruisseau Morrison sur les terres appartenant à l'entreprise. Le présent rapport est un résumé des activités menées sur le terrain ainsi qu'une analyse préliminaire des données de 2011 à 2014 inclusivement.

## INTRODUCTION

Morrison Creek lamprey, *Lampetra richardsoni* variety *marifuga* (Beamish 1987) are known to be present only in Morrison Creek in Courtenay, BC. In 1995, this variety was designated Endangered by COSEWIC and is currently protected under the *Species at Risk Act* (SARA). Very little information is known about the biology of this variety of lamprey; even less is known about the status of the population. As an endangered species listed under SARA, it is a requirement that an action plan be created based on the species' recovery strategy. An element of the recovery strategy is the development and implementation of a long term monitoring program to assess the abundance and distribution of this species (DFO 2007).

Between late May and July, the silver coloured Morrison Creek lamprey enter into their spawning phase and can be captured either through electroshocking or in passive downstream live traps. For three years, 2011-2013, concerted efforts were made to live trap Morrison Creek lamprey in Morrison Creek before and during spawning time as little work had been done on this species since the 1980s by Dr. Beamish and his team from the Pacific Biological Station in Nanaimo. A complete record of the catches and field work from the 1980s has been summarized by Beamish (2013).

Subsequent to critical habitat consultations for Morrison Creek lamprey in 2013, discussions began with Hancock Forest Management (HFM) regarding potential lamprey management on their property. In 2014, DFO worked collaboratively with HFM to assess the extent of the distribution of lamprey within the headwaters of Morrison creek on the land owned by the company. This report is a summary of field activities and a preliminary analysis of data for 2011 to 2014 inclusive. It does not contain a complete description of other fish and crustacean species collected.

## METHODS

### 2011-2013 in-stream trapping

The trapping methods remained the same throughout 2011-2013, however the trapping dates, numbers of traps used and locations varied (Table 1).

### *Trapping equipment*

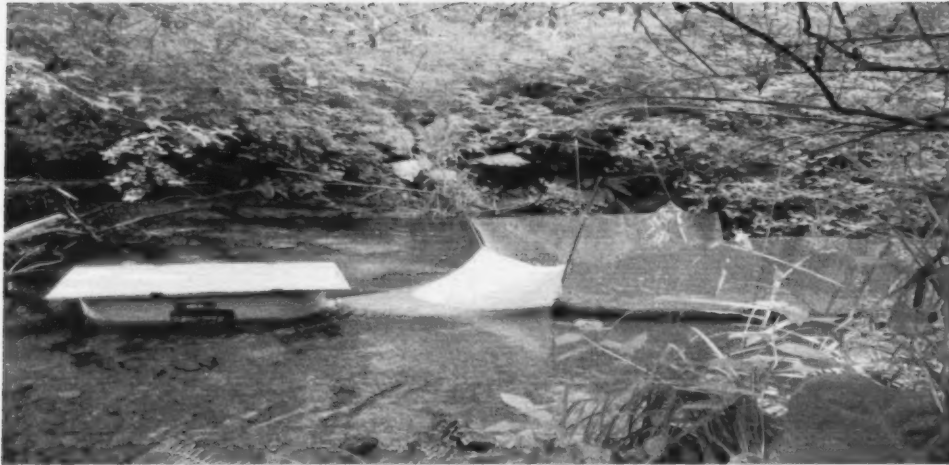


**Figure 1. Photograph of live capture downstream lamprey trap installed in Morrison Creek, 2012 (J. Wade)**

Live capture downstream traps (Figure 1) were used to passively collect adult and post spawn lamprey in Morrison Creek. Although targeting free swimming adults, migrating ammocoetes were also intercepted. These traps consist of a modified collection tank (110 cm long x 50 cm wide x 42 cm high) with screened "windows" (0.35 cm<sup>2</sup> mesh) on the back and two sides to allow water to flow through. On the front (upstream) side of the collection tank, a funnel made of fine mesh netting was affixed with a hose clamp to a 4 inch diameter (approximately 10 cm) pipe leading into the tank. The sides of the funnel were affixed to the "wings" made of wire mesh (1 cm<sup>2</sup>) and secured in place with rebar every 60-80 cm as required. In order to ensure that lamprey could not swim through the mesh of the wings, a second layer of mesh (0.5 cm<sup>2</sup>) was placed over the length of the arms and held in place with cable ties. The wings were oriented in such a fashion to ensure at least 50% of creek's width would be funneled into the trap. The bottom of the wings and the funnel were lined with large rocks in order to prevent the escape of any animals and ensure their diversion into the collection tank. Inside the collection tank, a wire mesh funnel was placed inside the inlet pipe to ensure that lamprey would not swim back out. Rocks were placed in the bottom of the tank to ensure that it would not move if the water levels changed rapidly. All tanks were covered with a plywood lid secured with clamps to prevent predators accessing the fish and to reduce stress by keeping a dark environment. Each trap was checked daily to ensure it remained secure, free of debris and count and release any animals caught



**Figure 2. Trapping locations in Morrison Creek 2011-2013 (A= Munster Road; B= Marsden Road; C= Powerhouse Road; D= Roy Morrison Park; E= Willemar Road and 1st Street)**

Site selection for traps was dependent on water flow, accessibility (much of Morrison Creek abuts private land), and substrate. Traps were placed in locations which had substrate suitable for lamprey spawning in the upstream vicinity as well as enough water flow to “flush” post spawn adults into the collection tank.

In 2011, three traps were installed and monitored throughout June and July (Table 1). The first trap was placed in Roy Morrison Park (Roy Morrison Park, site 1) on June 8. After several weeks, the trap was moved approximately 30 m downstream to a more suitable location (Roy Morrison Park, site 2). A second trap was installed upstream in Morrison Creek off Munster Road on June 21<sup>st</sup>. After a few weeks of trapping, very little was found in this trap so it was moved to a location off Powerhouse Road on July 11<sup>th</sup>. A third trap was placed in the creek off Willemar Road, near Puntledge Park on June 29<sup>th</sup>. All traps were removed on July 23<sup>rd</sup>, 2011.

On June 1, 2012, three traps were installed in Morrison Creek and remained in place until July 26, 2012 (Table 1). With the exception of the trap installed in Roy Morrison Park (Roy Morrison Park, site 1) all traps remained where they were installed for the duration. Because of low water, the trap in Roy Morrison Park was moved approximately 30 m upstream from its original location to an area of greater depth and higher flow rate. A second trap was placed in the Creek at Marsden Road and a third at First Street and Willemar Road.

On June 13, 2013, three traps were installed in Morrison Creek and monitored daily until their removal on July 16 (Table 1).

**Table 1: Location of traps in Morrison Creek 2011-2013**

| Year | Location                          | Installation | Removal | Latitude      | Longitude      |
|------|-----------------------------------|--------------|---------|---------------|----------------|
| 2011 | Roy Morrison Park site 1          | June 8       | June 21 | 49°40'48.29"N | 125° 1'17.42"W |
|      | Roy Morrison Park site 2          | June 21      | July 23 | 49°40'48.76"N | 125° 1'16.85"W |
|      | Munster Road                      | June 21      | July 11 | 49°40'11.55"N | 125° 2'23.66"W |
|      | Powerhouse Road                   | July 11      | July 23 | 49°40'38.82"N | 125° 1'36.93"W |
|      | Willemar Road/1 <sup>st</sup> St. | June 29      | July 23 | 49°41'11.64"N | 125° 0'56.86"W |
| 2012 | Roy Morrison Park site 1          | June 1       | June 18 | 49°40'48.76"N | 125° 1'16.85"W |
|      | Roy Morrison Park site 2          | June 18      | July 26 | 49°40'48.29"N | 125° 1'17.42"W |
|      | Willemar Road/1 <sup>st</sup> St. | June 1       | July 26 | 49°41'11.64"N | 125° 0'56.86"W |
|      | Marsden Road                      | June 1       | July 26 | 49°40'27.46"N | 125° 2'14.91"W |
| 2013 | Roy Morrison Park                 | June 13      | July 16 | 49°40'48.76"N | 125° 1'16.85"W |
|      | Willemar Road/1 <sup>st</sup> St. | June 13      | July 16 | 49°41'11.64"N | 125° 0'56.86"W |
|      | Marsden Road                      | June 13      | July 16 | 49°40'27.46"N | 125° 2'14.91"W |

### *Sampling*

Once installed, all traps were checked daily. Using a small mesh aquarium dip-net, non-lamprey species were identified, enumerated and released downstream of the traps. Lamprey were removed with a dip-net and placed in a large bucket filled with water taken directly from the

creek. On-shore, each lamprey was anesthetized with TMS, identified to stage of development, measured for length using a standard measuring board. A sub-set of lamprey were fin clipped for DNA analysis. Once the fish had been sampled they were placed in a second bucket filled with creek water and allowed to recover from anesthesia. Once completely recovered they were returned to the water, downstream of the trap.

### *Identification*

Because it is not possible to distinguish between the *Lampetra richardsoni* and *L. richardsoni* variety *marifuga* until after metamorphosis when the latter is a silver colour, results will be reported for all lamprey in Morrison Creek.

## **2014 Headwaters Trapping**

### *Trapping equipment*



**Figure 3. Milk crate trap with straw and lid used in lamprey studies**

In 2014, two types of passive traps were placed in the wetlands area of Morrison Creek owned by HFM in order to determine presence of lamprey and ultimately the extent of their range. The first type of trap used was a milk crate trap (Figure 3). This trap is a milk crate with hay placed inside and a lid made out of plywood. The lid serves to keep the trap dark and to deter potential predators. The trap is then placed in the creek or body of water at least one third submerged and secured in place with a rope. A rock is placed on the lid of the trap in order to make sure it does not float. The second type of trap used was a modified recreational fishing bait trap (Figure 4) which was also stuffed with straw like the milk crate traps and deployed similarly. This trap does not have a lid which would have created a dark environment.



**Figure 4. Bait trap with straw used in lamprey studies**

Both versions of these passive traps are appropriate for collecting ammocoetes or recently metamorphosed lamprey. They are not used to catch spawning lamprey. Spawning lamprey do not seek refuge as do lamprey at earlier stages of development.

The advantage of this type of trap is that it can be left unattended with no adverse effects on fish as they can exit the trap when they wish. This type of trap is appropriate for determining presence but not to evaluate abundance.

#### *Location and time of year*

Eighteen traps were installed on June 24<sup>th</sup>, 2014 and checked weekly (Figure 5). 2014 was a very dry summer and as a result traps were re-numbered and moved to other areas when water levels did not permit effective trapping. The goal of the study was to determine the extent of the lamprey's range within HFM's land; as a result traps were placed in creeks and ponds including those with low flow. The smaller bait traps were used in areas with water depths or widths which would not allow for the installation of milk crate traps. All traps were removed August 15<sup>th</sup>, 2014.

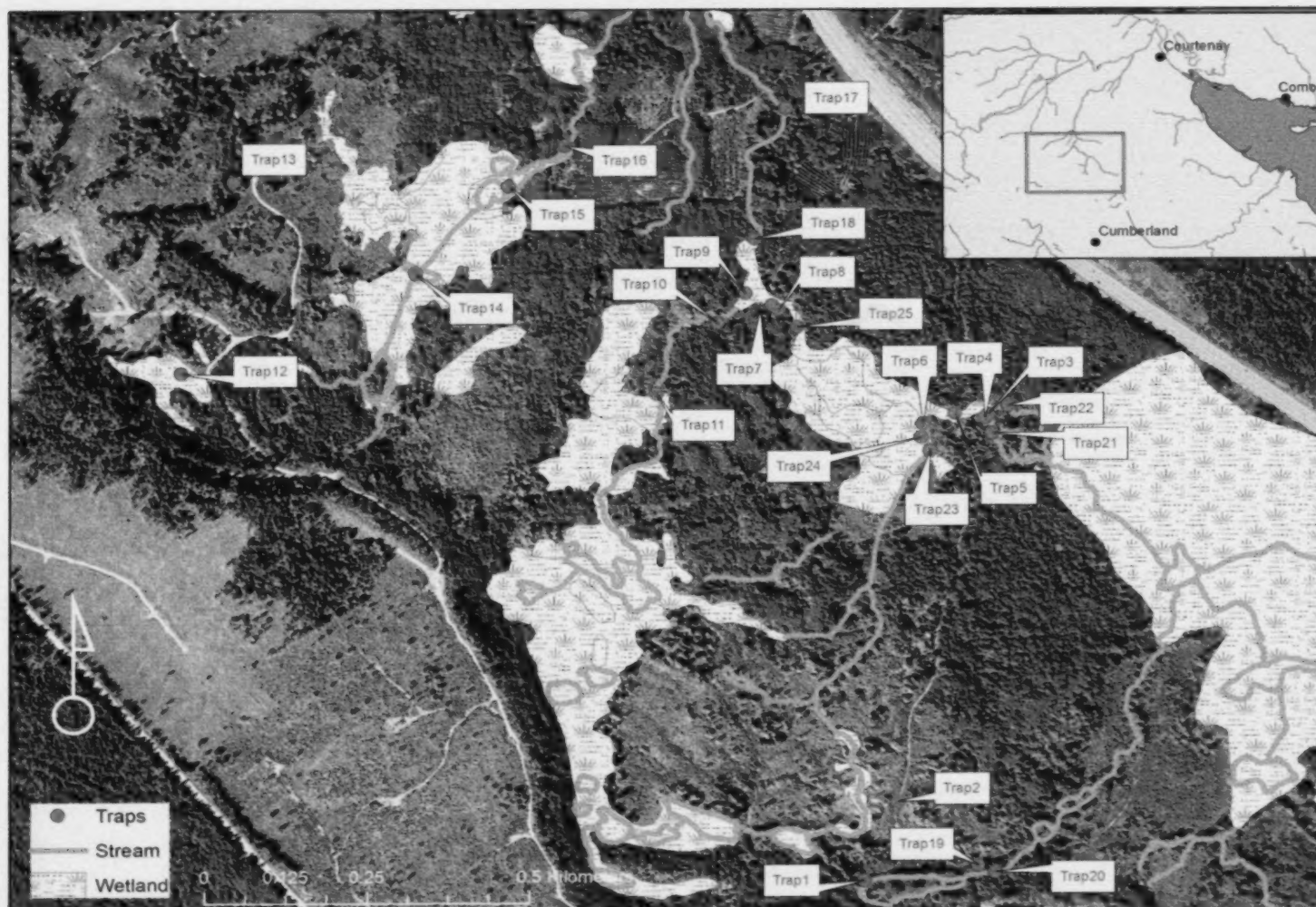


Figure 5. Locations of hay stuffed traps in wetland area of Morrison Creek (2014). A maximum of 18 traps were used at any one time. Traps were re-numbered as they were moved to new locations.

### Sampling

Traps were checked weekly beginning July 3<sup>rd</sup> and ending August 15<sup>th</sup>, 2014. Each trap was lifted from the water and quickly placed in a plastic tub. While some lamprey wriggle out of the trap into the tub others were discovered as the straw was pulled out of the trap and checked. After all the straw had been examined, the empty trap was placed back in the water, the straw put back in, lid secured and rope retied. Each lamprey was removed from the tub, enumerated, stage of development noted and returned to the wild. A subset of lamprey were anesthetized and a fin clip taken for DNA analysis as described previously.

## RESULTS

### 2011-2013 In-stream trapping

#### 2011

For the purposes of this summary, trapping results from Roy Morrison Park sites 1 and 2 have been combined due to their close proximity (Table 2). The total number of trapping days was 101 between all four locations. The greatest number of lamprey were captured at the Roy Morrison Park site (N=160) followed by the Willemar Rd. / 1<sup>st</sup> St. location (N=79). The total number of silver form (*L. richardsoni* var. *marifuga*) captured was 17, however there was one re-capture. The Munster Road location was the least successful location capturing only eight lamprey in total.

Table 2: Capture results from trapping in Morrison Creek during June and July 2011

| Trap location     | Trapping days | Total lamprey trapped | Silver form | Ammocoete | Adult/ Metamorphosing | Recaptured ( <i>L. richardsoni</i> ) | <i>E. tridentatus</i> | Salmonids*  |
|-------------------|---------------|-----------------------|-------------|-----------|-----------------------|--------------------------------------|-----------------------|-------------|
| Roy Morrison Park | 45            | 160                   | 7           | 19        | 117                   | 17                                   | 0                     | 330         |
| Munster Road      | 20            | 8                     | 0           | 1         | 7                     | 0                                    | 0                     | 114         |
| Powerhouse Road   | 12            | 13                    | 1           | 11        | 1                     | 0                                    | 0                     | 90          |
| Willemar Road     | 24            | 79                    | 9           | 10        | 54                    | 5                                    | 1                     | 920         |
| <b>Total</b>      | <b>101</b>    | <b>260</b>            | <b>17</b>   | <b>41</b> | <b>179</b>            | <b>22</b>                            | <b>1</b>              | <b>1454</b> |

\*salmonids were primarily coho salmon (*Oncorhynchus kisutch*) fry, few coho salmon smolt and cutthroat trout (*O. clarkii*)

## 2012

For the purposes of this summary, trapping results from Roy Morrison Park sites 1 and 2 have been combined due to their close proximity (Table 3). The total number of trapping days was 165, 55 trapping days at each of the three locations. The total number of lamprey trapped in 2012 was 77, 57 of which were captured at the Willemar Road location. Only four silver lamprey were captured in 2012.

**Table 3: Capture results from trapping in Morrison Creek during June and July 2012.**

| Trap location     | Trapping days | Total lamprey trapped | Silver form | Ammocoete | Adult/ Metamorphosing | <i>E. tridentatus</i> | Salmonids*  |
|-------------------|---------------|-----------------------|-------------|-----------|-----------------------|-----------------------|-------------|
| Roy Morrison Park | 55            | 5                     | 1           | 0         | 4                     | 0                     | 407         |
| Marsden Road      | 55            | 15                    | 1           | 1         | 13                    | 0                     | 1           |
| Willemar Road     | 55            | 57                    | 2           | 10        | 44                    | 1                     | 1092        |
| <b>Total</b>      | <b>165</b>    | <b>77</b>             | <b>4</b>    | <b>11</b> | <b>61</b>             | <b>1</b>              | <b>1500</b> |

\*salmonids were primarily coho salmon (*O. kisutch*) fry, few coho salmon smolt and cutthroat trout (*O. clarkii*)

## 2013

Traps were in place in Morrison Creek for a total of 99 trapping days, 33 days at each of three locations (Table 4). The majority (8 of 12) of the silver lamprey were captured in the Willemar Road trap. Very few lamprey in total were captured in 2013 (N= 31) as compared to 2011 (N=260) and 2012 (N=77).

**Table 4. Capture results from trapping in Morrison Creek during June and July 2013.**

| Trap location     | Trapping days | Total lamprey trapped | Silver form | Ammocoete | Adult/ Metamorphosing | Salmonids*  |
|-------------------|---------------|-----------------------|-------------|-----------|-----------------------|-------------|
| Roy Morrison Park | 33            | 14                    | 1           | 4         | 9                     | 266         |
| Marsden Road      | 33            | 5                     | 3           | 0         | 2                     | 215         |
| Willemar Road     | 33            | 12                    | 8           | 0         | 4                     | 1221        |
| <b>Total</b>      | <b>99</b>     | <b>31</b>             | <b>12</b>   | <b>4</b>  | <b>15</b>             | <b>1702</b> |

\*salmonids were primarily coho salmon (*O. kisutch*) fry, few coho salmon smolt and cutthroat trout (*O. clarkii*)

The dates and locations where the first silver Morrison Creek lamprey were captured was the 13<sup>th</sup> June in the Roy Morrison Park trap in 2011, 5<sup>th</sup> July in the Willemar Street trap in 2012 and 13<sup>th</sup> June in the Marsden Road trap in 2013.

### **2014 Headwaters trapping**

The mean lamprey catch per trap (Figure 7) varied from 0 to 28. Some trap locations were considerably more successful in trapping lamprey than others. The lamprey catch in some areas should not be considered definitive absence as water levels were extremely low this year as well as the passive nature of the trapping method. Although the survey was not designed to test the efficacy of the different traps types, it would appear that the bait traps were less successful than the milk crate traps. This may be due to location or possibly trap design or environmental conditions such as weather and water flow levels. Bait style traps were used in areas of low water depth and/or narrow channel width that could not accommodate the size of the milk crate traps. They also did not provide a dark environment as did the milk crate traps.

All lamprey captured in the wetland area were either ammocoetes or beginning to metamorphose. The greatest number of lamprey counted at any one time was from trap 10 located in the main stem of Morrison Creek (Figure 6). On both July 10<sup>th</sup> and July 19<sup>th</sup>, 45 lamprey were enumerated from trap 10.

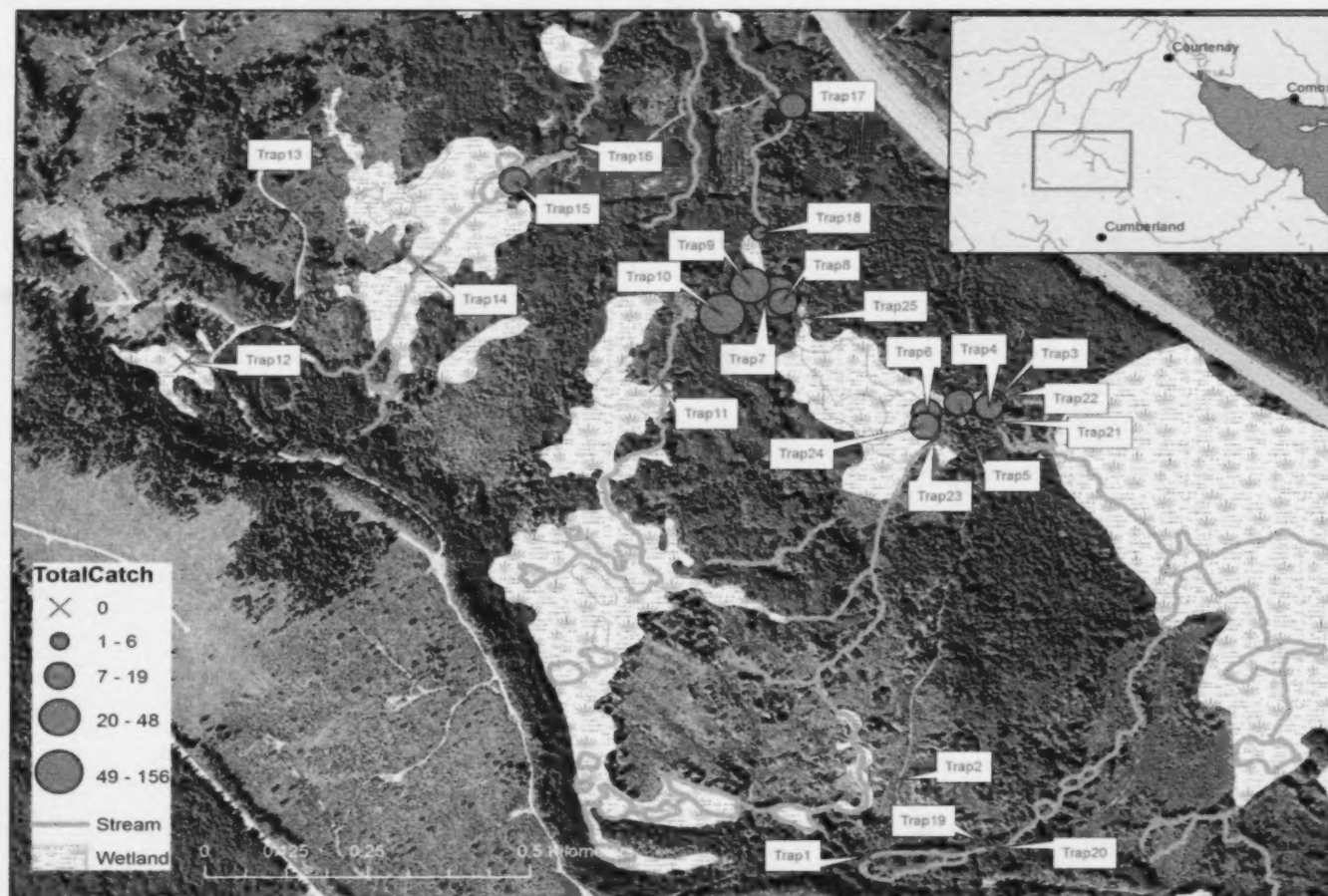


Figure 6. Total cumulative catch by trap in the wetland area of Morrison Creek (2014)

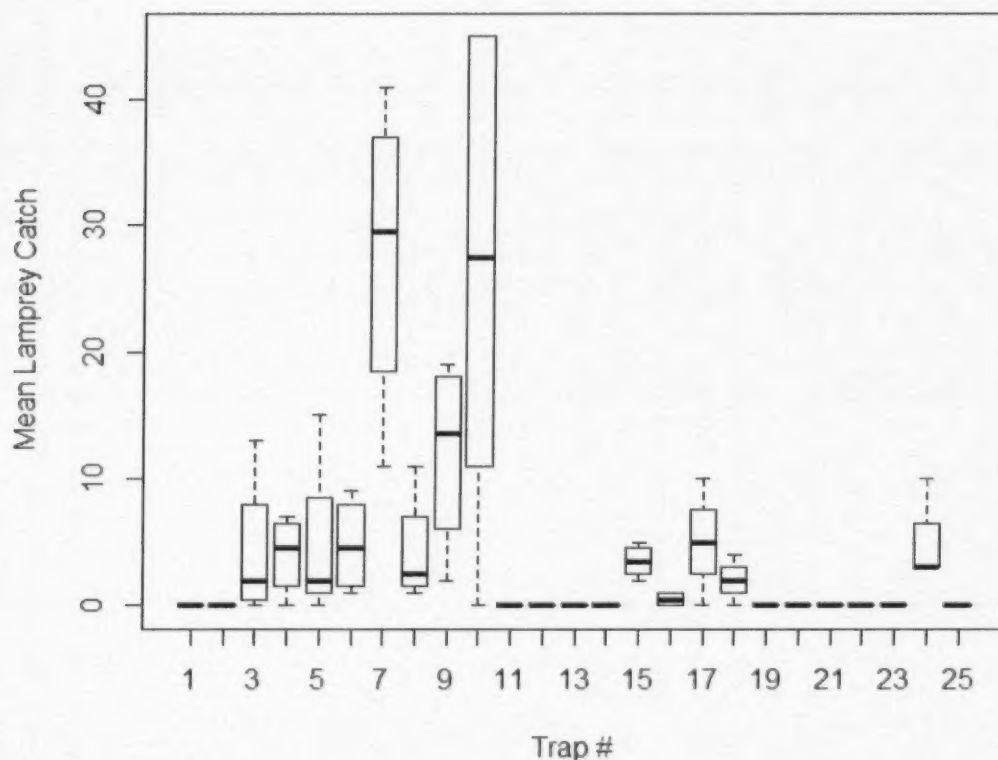


Figure 7: Boxplot of lamprey catch by trap in Morrison Creek wetland area (2014)

## DISCUSSION

Although trapping effort increased from 101 trapping days in 2011 to 165 trapping days in 2012 and dropped to 99 trapping days in 2013, the mean total lamprey catch per day (excluding *E. tridentatus*) was 2.6 (2011), 0.46 (2012) and 0.31 (2013). The number of Morrison Creek Lamprey captured varied from 16 individuals in 2011 to 4 in 2012 and 12 in 2013 with an average catch per day of 0.16, 0.02, and 0.12 respectively. Although it is not possible to directly compare catches from the 1980s to those reported here due to differences in trap locations and effort, Beamish (2013) reports that during the period of maximum catches, from mid-June to mid-July there was an average of 1.5 Morrison Creek Lamprey caught per day in an area which was considered to have the maximum abundance. If the 1.5 fish per day catch rates were applied

to recent surveys, 152 animals would have to have been caught in 2011, 248 in 2012 and 148 in 2013.

Although ammocoetes were not often counted separately in the work conducted in the 1980s (Beamish 2013), there were some traps in some years which did identify and enumerate total ammocoetes. One sample site in 1983 identified as the centre of abundance, reported a count of 218 ammocoetes, 64 "silver" form and 20 mature *L. richardsoni*. In 1984, three trapping sites were monitored between the end of May and mid-August (approx. 80 trapping days per site). One site reported 80 ammocoetes, 4 "silver" form and 27 *L. richardsoni*; the second site, located at Marsden Road, reported 178 ammocoetes, 13 "silver" form and 39 *L. richardsoni*; the third location reported 205 ammocoetes, 95 "silver" form, and 20 *L. richardsoni*. In total, in three years of trapping, 2011-2013, 56 ammocoetes were collected.

The total number of lamprey captured, regardless of developmental stage, is drastically reduced from the 1980s to recent trapping activities in 2011-2013.

Obstacles to upstream fish movement have been identified in the mainstem of Morrison Creek (Wade and Beamish, 2014). Efforts are underway to remediate these obstacles. It is not known if these obstacles are impacting the population abundance but they are likely fragmenting the available habitat and hindering upstream movements of local lamprey. This fragmentation could be directly impacting the trapping success and creating population pockets of lamprey upstream of the areas in which trapping efforts had identified large numbers of lamprey in the 1980s. Locations suitable for lamprey spawning and subsequent trapping are more common within the urban area of the creek, which is why those areas were chosen for trap placement. Discussions are underway with Hancock Forest Management to place traps in the main stem of Morrison Creek which flows through their property at the source of Morrison Creek in an attempt to catch adult and post-spawning lamprey. Preliminary milk crate trapping in 2014 identified areas in which ammocoetes and recently metamorphosed lamprey were abundant; these data will inform future work in this area.

It is not known what other potential stressors may be contributing to the decline in catches between the 1980s and today. The recently observed lower counts of silver form Morrison Creek lamprey do make it urgent to take action to investigate lamprey population trends and habitat needs in Morrison Creek basin. The survey work in the headwaters in 2014 showed the presence of lamprey, particularly in the main stem of Morrison Creek but also in smaller side channels and wetted areas. It was not possible to determine if these lamprey were or were not Morrison Creek Lamprey. This information is important both for the effective management of the species but also for Hancock Forest Management to reach their land management goals. Morrison Creek lamprey distribution has never been assessed in this area and it is important to determine if they are spawning in the headwaters. This information may help determine the extent of or impacts of habitat fragmentation on the population caused by the barriers as well as assess the impacts of barrier removal.

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